MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS 1963 A

ENHANCED
DLA DISTRIBUTION SYSTEM (EDDS)
ANALYSIS

DEPARTMENT OF DEFENSE

DEFENSE
LOGISTICS
AGENCY
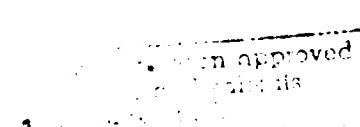
Operations Research and Economic Analysis Office

Cameron Station,
Alexandria Virginia 22304 6100

February 1987

JUL 1 7 1987

A

Enhanced DLA Distribution System (EDDS) Analysis

February 1987

Charles F. Myers
Operations Research and Economic Analysis Office
Headquarters, Defense Logistics Agency
Cameron Station, Alexandria, Virginia

DEFENSE LOGISTICS AGENCY

HEADQUARTERS
CAMERON STATION
ALEXANDRIA, VIRGINIA 22314

DLA-LO

FOREWORD

This report documents an analysis of the proposed Enhanced DLA
Distribution System (EDDS). The EDDS concept involves the collection
of small vendor shipments destined to DLA depots at a designated point
within the United States for consolidation and shipment, in truckload
lots, to the consignee depot. Savings are expected to accrue based on
the difference between the cost of vendors making small shipments
direct to the consignee depot and the cost to ship under the EDDS
consolidation concept.

The analysis compared the current system of inbound vendor shipping
practices to the proposed EDDS concept using a computer model and
historical vendor contract data for a one-year period. A comparison
of the costs of both shipping methods was made and showed a savings,
under the EDDS concept, of approximately $14 million for one year.

Several benefits and problem areas of the EDDS concept were addressed.
A recommendation that EDDS be adopted for DLA inbound vendor traffic
was made.

ROGER C. ROY
Acting Assistant Director,
Policy and Plans

iii

CONTENTS

LIST OF TABLES

LIST OF FIGURES

I. INTRODUCTION

The Transportation Division of the Directorate of Supply Operations (DLA-OT), Defense Logistics Agency (DLA), requested a study be conducted to determine the cost effectiveness of a proposed Enhanced DLA Distribution System (EDDS). EDDS is designed to save transportation dollars on inbound vendor traffic by consolidating a number of less-than-truckload (LTL) shipments, at or near their origins, into a single truckload shipment which is then forwarded at truckload (TL) rates to the ultimate depot destination. The savings are computed on the difference between shipping the freight direct to the depot under LTL rates versus consolidation and shipment under TL rates. These savings can be substantial at times.

A. Background

Consolidation of inbound freight, while not a new concept in commercial industry, is relatively new to the Department of Defense (DoD). In October 1985, Colonel Gordon Smith, USAF, Depot Commander, and Lt Col Daniel Schroen, USAF, Chief of Transportation and Shipping Division, Defense Depot, Columbus, OH (DDCO), conducted a preliminary study to determine if consolidation could be utilized as a valid option in the shipping of vendor originated traffic to the various DLA depots. Their study compared two alternative shipping methods: (1) the current method of shipping LTL freight direct from the vendor to the DLA depot under higher LTL rates, and (2) establishing consolidation points at DLA depots, having vendors ship to the nearest depot, consolidating the freight into TL lots, and shipping the consolidated lots to the consignee DLA depots at lower TL rates. These shipping methods are illustrated in Figure 1.

Figure 1. ALTERNATIVE SHIPPING METHODS

Current Method

▲ Vendor
■ Depot

Proposed Method

▲ Vendor
■ Depot
● Consolidation Point

1
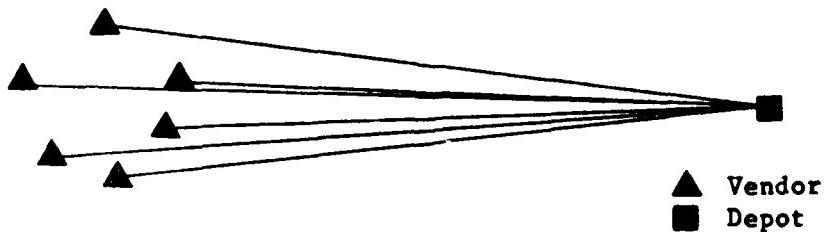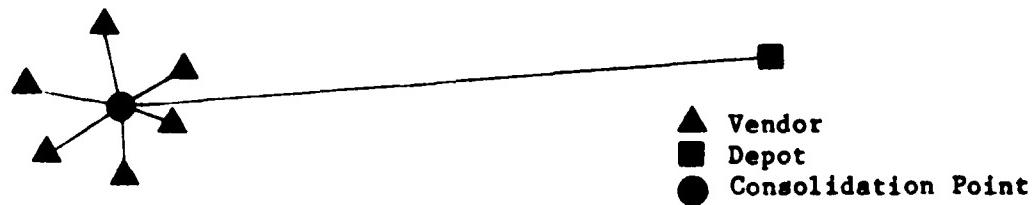
The DDCO study was based mainly on estimates of vendor tonnages from selected points east of the Mississippi River to DLA Depots located at Memphis, TN, Ogden, UT, and Tracy, CA. Analysis of the inbound rates using the above alternatives resulted in the selection of only those points which resulted in a dollar savings - all other points were omitted. The bottom line of the DDCO study was that approximately $10 million could be saved by instituting the EDDS concept using DDCO as the consolidation point for east coast vendors shipping to points at or west of the Mississippi River.

The main problem with the DDCO study was the fact that actual vendor shipping data were not available and only certain traffic was used to compute savings. Prior to initiating a program that may cause changes to the existing system, DLA-OT wanted a comprehensive analysis of EDDS using a computer model that would use historical vendor data and approximate the costs of the two alternative methods.

B. **Purpose.** The purpose of this study is to determine the cost savings, if any, of instituting the EDDS concept for LTL vendor shipments to the DLA depots.

C. **Objectives.** The objective of this study is to quantify and contrast the costs of shipping LTL vendor traffic under two alternative shipping methods: (1) the current method of shipping LTL freight direct from the vendor to the DLA depots under LTL transportation rates, and (2) establishing consolidation points located strategically throughout the United States, having the vendors ship to the nearest consolidation point, consolidating the shipments into TL lots, and shipping the TL lots to the consignee depots under lower TL rates. In addition to cost, the location of the consolidation points is considered.

D. **Scope and Project Limitations**

This study examined contract line items weighing less than 10,000 pounds from the Active Contract File (ACF) for 1985, 10,000 pounds being the DoD breakpoint for LTL shipments. Several problems were encountered with the ACF and were handled as follows:

1. The ACF is an active file maintained by each of the DLA Supply Centers (DSCs) which contains a large amount of data concerning procurement contracts. As a contract is fulfilled, the line items are closed and then dropped from the file after 30 days. A copy of the active record is not retained by the Center in computer form. Until recently the ACF was not collected and retained on a regular basis by any activity within DLA. The 1985 ACF file used in this study was collected from each of the DSCs by requesting a dump of the file as shown in Table 1.

As can be seen from the collection dates, large gaps exist where a contract could have been initiated, fulfilled, and dropped from the file without ever being captured in the collection process. This is especially true in the case of small purchase contracts. We estimate that approximately 20-30 percent of the small shipment data were lost.

2

Table 1.

RECEIPT OF ACF DUMPS FROM DSCs

Commodity	Dec 84	Mar 85	Oct 85	Mar 86
General	X	X	X	X
Industrial	X	X	X	X
Electronics	X	X	X	X
Construction	X	X	X	X
Textile			X	X
Medical			X	X

2. Shipment origin is an important part of this analysis. In order to locate origin points, the address for the federal supply code for manufacturers and distributors (FSCM) was used as the origin for the shipment. In many instances both the headquarters and manufacturing address are the same; however, there are exceptions where some manufacturers have only one FSCM and multiple plant locations. In this instance, some plant site information will be lost. Many of the larger manufacturers have multiple FSCMs to cover the problem of multiple manufacturing sites. We estimate that the origins used in this analysis are 90 percent correct.

3. Shipping weight is not a field captured in the ACF. To approximate the ship weight of each ACF line, the Mechanization of Warehousing and Shipment Processing databank file (NSN master file) was used to append a unit weight to each line item. The actual unit weight of the item was then multiplied by the quantity requested on the ACF to get the total weight of the items requested. Finally, the requested weight was multiplied by 1.10 to add a 10 percent packing factor to each line item.

II. STUDY APPROACH

The study was accomplished in the following phases: data preparation and building of the computer model.

A. Phase I: Data Preparation

A derivative of the Active Contract File was used to conduct the analysis. Prior to using the file several steps were needed to prepare and validate the data. The steps were as follows:

1. Input files for all commodities (G-general; C-construction; E-electronics; I-industrial; M-medical; T-textile) were modified by pulling only the data fields needed, sorting by national stock number (NSN), and merged into one input file.

2. This new file was then matched by NSN against the NSN master file to append a unit weight to each line item and sorted by FSCM in preparation for the final step.

3

3. In the final step, the file was matched by FSCM against a dump of the Standard Automated Material Management System (SAMMS) Combined Address File (SCAF), and the 3-digit sectional zip code for the manufacturer address was appended to each record. In addition, the consignee depot was identified by 3-digit zip code and the estimated ship weight was computed and appended to each record. The final version of the vendor file contained 697,789 records for an approximate one year of DLA procurement activity.

Prior to using the final version of the vendor file created for the study, a validation process was conducted. The validation consisted of a weight roll-up of lines less than 10,000 pounds by state for visual review. Table 2 is a copy of the initial weight roll-up sorted from the high to low weight states. The states listed at the top of the figure indicate that the majority of the weight and lines are coming from the heavily industrialized areas of the country, i.e., the northeast and southwestern areas. To better see the distribution, a plot of the weight, by weight categories, was made and is shown in Figure 2.

Although the weights appeared to fit a pattern consistent with the distribution of industrialization in the U.S., a further test was conducted to see if the data were consistent with DLA procurement sources. A map was located of DLA procurement sources in FY-67[1] based on percentage of weight procured from each of the contiguous states. By taking the weight roll-up in Table 2 and normalizing the numbers it was possible to plot both the FY-67 and the 1985 data on a U.S. map in an identical fashion. Figure 3 shows both plots for comparison purposes. The plots show some movement in the percentages between the southeastern states and between the states in the northeast but overall the distribution appears to be very close. After making these visual checks the data were determined to be representative of DLA procurement sources.

B. **Phase II: Building the Computer Model**. In the DDCO study, only one consolidation point was used (DDCO) in conjunction with destination points on or east of the Mississippi River. Initially, this was the approach considered by DLA-OT for testing the EDDS concept on a small scale prior to implementation system-wide. After conversations with DLA Counsel, DLA-OT was advised that legally DLA could not test one regional consolidation point for vendor inbound shipments. Counsel advised that one point would discriminate against vendors located outside the regional consolidation point area[2]. Counsel did, however, tentatively approve a

---

[1] Defense Logistics Agency, Stock Positioning and Transportation Study (SPATS), 1 September 1968, Tab 2-1.

[2] Inter-Office Memorandum from DLA-OT, Request for Enhanced DLA Distribution (EDDS) Analysis, 23 September 1986.

TABLE 2 VENDOR WEIGHT BY STATE FOR CY 85

ORIGIN STATE	WEIGHT	NO. LINES
NEW YORK	28,379,190	63,911
PENNSYLVANIA	24,141,257	63,217
NEW JERSEY	23,297,436	51,738
OHIO	20,898,007	123,718
CALIFORNIA	16,527,844	83,713
ALABAMA	14,453,764	9,018
ILLINOIS	13,852,367	23,603
VIRGINIA	10,010,414	18,580
MICHIGAN	8,623,573	14,985
TENNESSEE	8,417,460	11,962
NORTH CAROLINA	8,356,383	7,905
TEXAS	7,743,495	37,137
MASSACHUSETTS	6,479,771	18,858
MARYLAND	6,188,480	19,924
CONNECTICUT	5,630,714	17,486
FLORIDA	5,480,326	15,573
MISSOURI	5,427,282	7,440
ARKANSAS	4,796,431	4,925
WISCONSIN	3,969,614	7,137
INDIANA	3,351,187	8,444
GEORGIA	3,244,522	4,027
OKLAHOMA	2,934,236	2,394
RHODE ISLAND	2,735,612	2,335
KENTUCKY	2,176,294	2,648
MINNESOTA	2,084,362	3,797
DELAWARE	1,324,435	891
OREGON	1,282,442	4,663
COLORADO	1,107,480	2,273
WASHINGTON	1,085,442	4,624
WEST VIRGINIA	1,015,390	962
SOUTH CAROLINA	968,116	2,881
MISSISSIPPI	905,942	1,252
KANSAS	838,627	6,181
LOUISIANA	836,100	1,119
MAINE	706,147	627
NEBRASKA	623,088	2,417
NEW HAMPSHIRE	595,792	2,778
ARIZONA	421,618	3,134
VERMONT	388,491	1,181
DIST OF COLUMBIA	330,720	673
UTAH	288,722	936
IOWA	278,165	2,856
MONTANA	167,898	138
WYOMING	81,542	22
IDAHO	54,914	288
SOUTH DAKOTA	54,766	173
NEVADA	39,705	153
NORTH DAKOTA	9,028	45
NEW MEXICO	2,233	248
GRAND TOTALS	252,612,831	664,992

FIGURE 2 WEIGHT BY STATE PLOT

ORIGIN WEIGHT BY STATE
In Thousand of Pounds (000)

WEIGHT CATEGORIES

● DLA Depot
▲ Commercial

0 to 500
501 to 1000
1001 to 5000
5001 to 10000
10001 to 15000
15001 to 20000
20001 to 25000
25001 to 30000
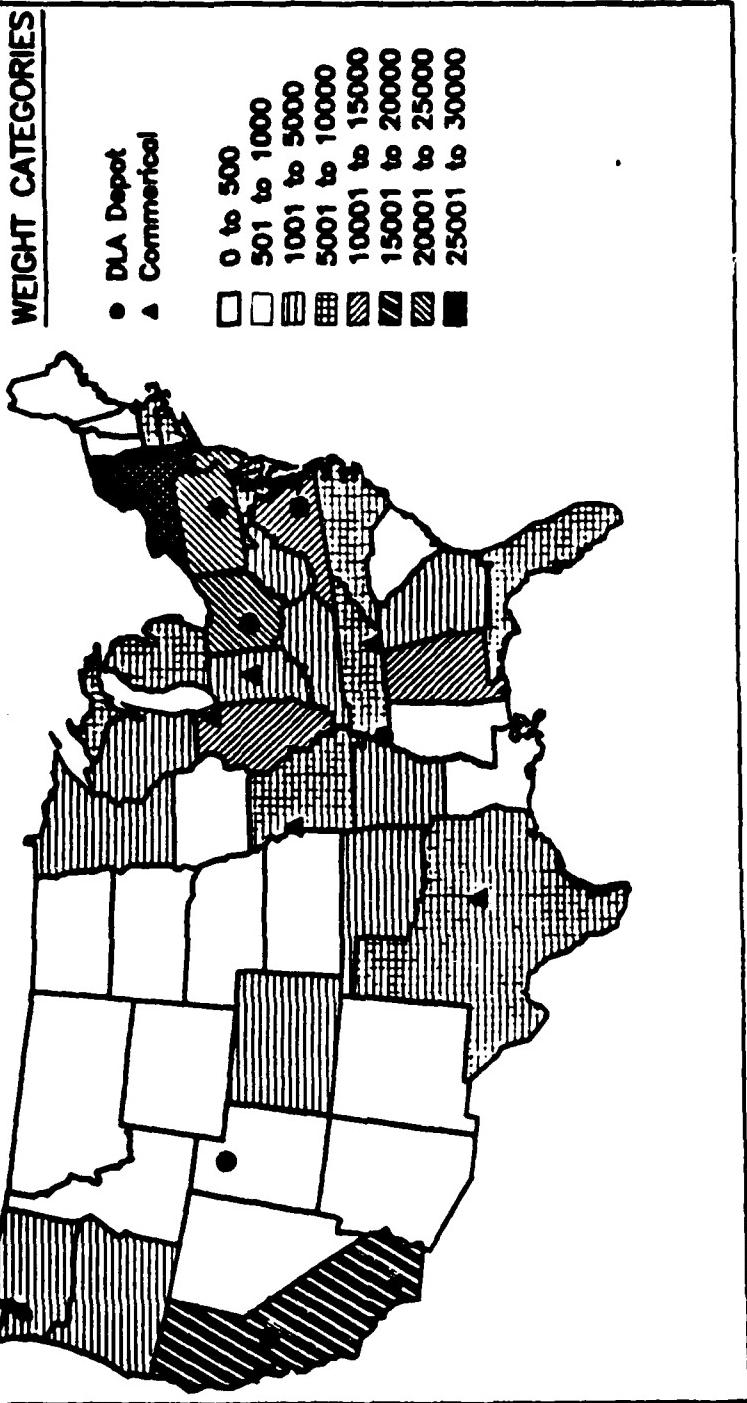
FIGURE 3 VENDOR WEIGHT DISTRIBUTION COMPARISON

FY 67 VERSUS CY 85

WEIGHT CATEGORIES

- 0.01 to 1.28
- 1.28 to 2.55
- 2.55 to 3.82
- 3.82 to 5.09
- 5.09 to 6.36
- 6.36 to 7.83
- 7.83 to 8.9
- 8.9 to 11.17
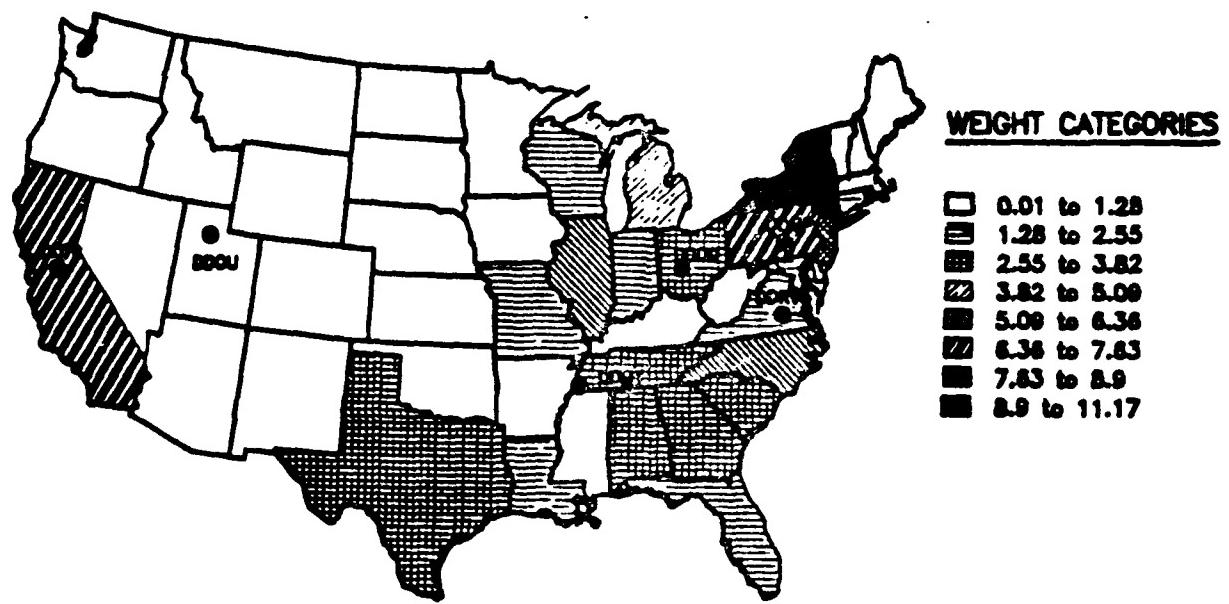
Percentage by State of FY 67 Procurements

WEIGHT CATEGORIES

- 0.01 to 1.28
- 1.28 to 2.55
- 2.55 to 3.82
- 3.82 to 5.09
- 5.09 to 6.36
- 6.36 to 7.83
- 7.83 to 8.9
- 8.9 to 12.23
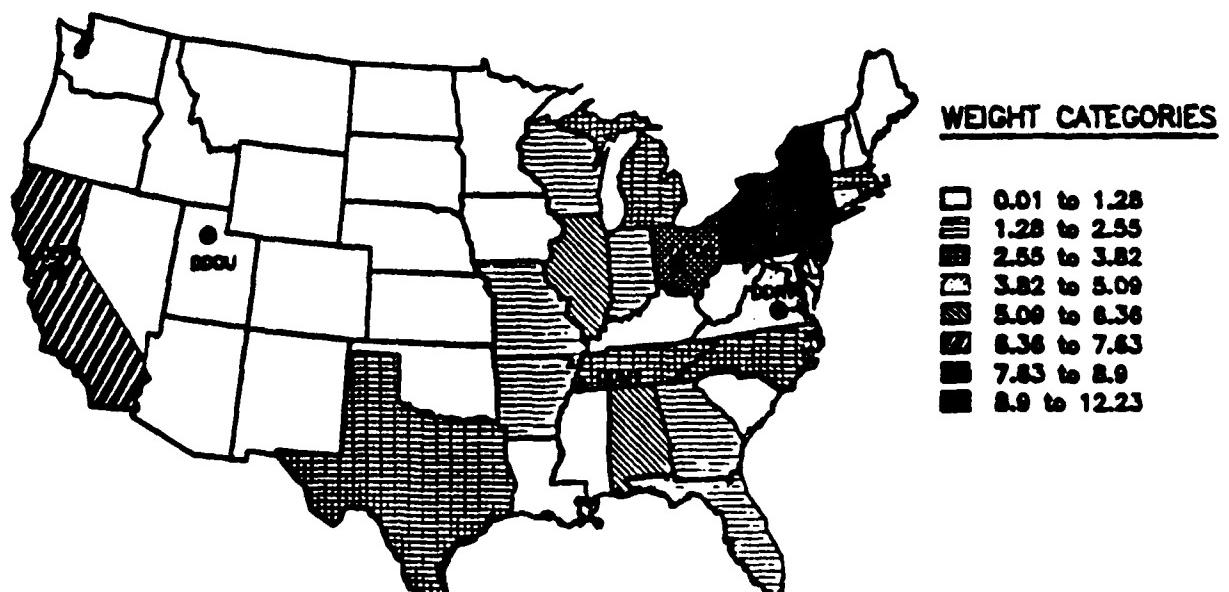
Percentage by State of CY 85 Procurements

concept whereby potential vendors could bid free-on-board (FOB) destination prices to any one of several consolidation points located throughout the contiguous states. Counsel felt that if this approach were taken all vendors would be treated equally. In building the model the total system concept was used.

1. Methodology

To process the inbound vendor shipments both shipment methods illustrated in Figure 1. had to be modelled. This was broken down into the following steps:

     a. Select from the ACF input file all contract lines less than 10,000 pounds. Consider each line to be a separate shipment.

     b. Determine whether the shipment is eligible for parcel post (less than 70 pounds), if not, process as LTL.

     c. Determine the cost to make each shipment direct from the vendor source to the consignee depot using the lowest commercial small parcel rate[1] for parcel post eligible shipments or Class 77.5 commercial truck rates[2] for LTL eligible shipments. Tally both total costs and shipment counts by receiving depot.

     d. Determine the cost to consolidate vendor shipments at the least cost consolidation point using the lowest commercial small parcel rate for small parcel eligible shipments or Class 77.5 commercial truck rates for LTL eligible shipments. Tally both total costs and shipment counts by receiving depot and consolidation point.

---

[1] The lowest parcel post rates were determined by building a table using a combination of the lowest rates from the most current Fourth Class United States Postal Service (USPS) and the United Parcel Service (UPS) rate tables.

[2] Class 77.5 commercial truck rates were assumed to approximate vendor outbound costs since each item was not classified and rated using the National Motor Freight Classification commodity classification. Commercial rates were purchased from Roadway Express, Inc., for all interstate 3-digit to 3-digit sectional zip code combinations. These rates were tested and are approximately 1.3 percent lower than the bureau rates in effect for the same class. Intrastate rates were approximated by linear equations developed using the methodology described in Appendix A.

e. Determine the approximate cost to consolidate the vendor freight at each consolidation point into truckload lots by consignee depot using a consolidation factor of $1.35[1] per hundred weight (cwt). A truckload weight factor of 30,000 pounds is assumed for consolidated shipments to the consignee depots.

f. Determine the cost and number of truckloads per year from each consolidation point to each DLA depot. Cost for consolidation point to consignee depot transportation was assumed to be at a 30,000 pound minimum and computed using the First Destination Guaranteed Traffic Tender rates negotiated for DLA by the Military Traffic Management Command (MTMC) effective 15 May 1985 for a one-year period.

g. Analyze the cost under both shipping methods and determine the difference.

After reviewing the steps needed to make the total analysis it was decided to accomplish steps a. through d. using a COBOL program on the mainframe computer and steps e. through g. using the microcomputer and Lotus 1-2-3.

2. <u>COBOL Model</u>. The COBOL programming language was used to model steps a. through d. because of the size of the input files and its table handling capabilities. The program was designed to process up to a maximum of 15 consolidation points located at any point in the continental United States (CONUS). It will compute the cost of the direct vendor to depot movement and the shipping cost from the vendor to the least cost consolidation point for each record processed. Totals are tallied for the different movements and dumped at the end of the program. Figures 4.a. through d. are flow charts of the major processing modules detailing the flow of each record through the program. The output from the program consists of totals by depot and consolidation point which are then loaded into a Lotus 1-2-3 spreadsheet for analysis.

3. <u>Lotus 1-2-3 Spreadsheet Model</u>

Lotus 1-2-3 was used to analyze the COBOL output because of the ease with which changes could be made to various pieces of input data. The spreadsheet model is broken down into two major sections: individual point analysis and total system analysis.

a. <u>Individual Point Analysis</u>. The individual point analysis is designed to analyze the data for each consolidation point selected for study. The analysis contains three parts: direct delivery cost estimate, consolidation costs estimate, and the overall cost analysis. A copy of the individual point analysis for the Los Angeles, CA consolidation point is shown in Table 3. The direct delivery cost

---

[1] A $1.35 per cwt factor is based on commercial industry estimates for consolidation of a combination of both loose and palletized shipments.

FIGURE 4.a. Main Program Control Paragraph

```
                    ╭─────────────╮
                    │  Main Pgm.  │
                    │  Control    │
                    ╰──────┬──────╯
                           │
                    ╱──────┴──────╲
                   ╱    Open       ╲
                  │    Input &     │
                  │    Output      │
                   ╲   Files      ╱
                    ╲─────┬──────╱
                          │
                   ╱──────┴───────╲
                  │  Initialize    │
                  │  Input Files   │
                  │ Move Ship-From │
                   ╲ to Old-Zip   ╱
                    ╲─────┬──────╱
                          │
                  ┌───────┴────────┐
                  │ Move Zeros to  │
                  │  Hold Areas    │
                  │      &         │
                  │   Tables       │
                  └───────┬────────┘
                          │
                  ┌───────┴────────┐
                  │    Load        │
                  │ Small Parcel-  │
                  │ Rate Tables    │
                  └───────┬────────┘
                          │
      ┌───────────────────┤
      │                   │
  ┌───┴──────────┐        │
  │  Perform     │        │
  │Process-Vendor│        │
  │  Record      │        │
  └───▲──────────┘        │
      │                   │
      │            ╱──────┴──────╲
      │           ╱      If       ╲
      │    No    ╱      end        ╲
      └─────────┤       of          │
                 ╲     file        ╱
                  ╲──────┬────────╱
                         │ Yes
                  ┌──────┴───────┐
                  │   Perform     │
                  │ Print-Totals  │
                  └──────┬───────┘
                         │
                  ╱──────┴───────╲
                 │    Close       │
                 │   Input &      │
                 │   Output       │
                  ╲  Files       ╱
                   ╲─────┬──────╱
                         │
                  ┌──────┴───────┐
                  │    Stop       │
                  │    Run        │
                  └──────┬───────┘
                         │
                  ╭──────┴───────╮
                  │  End-of-Job  │
                  ╰──────────────╯
```
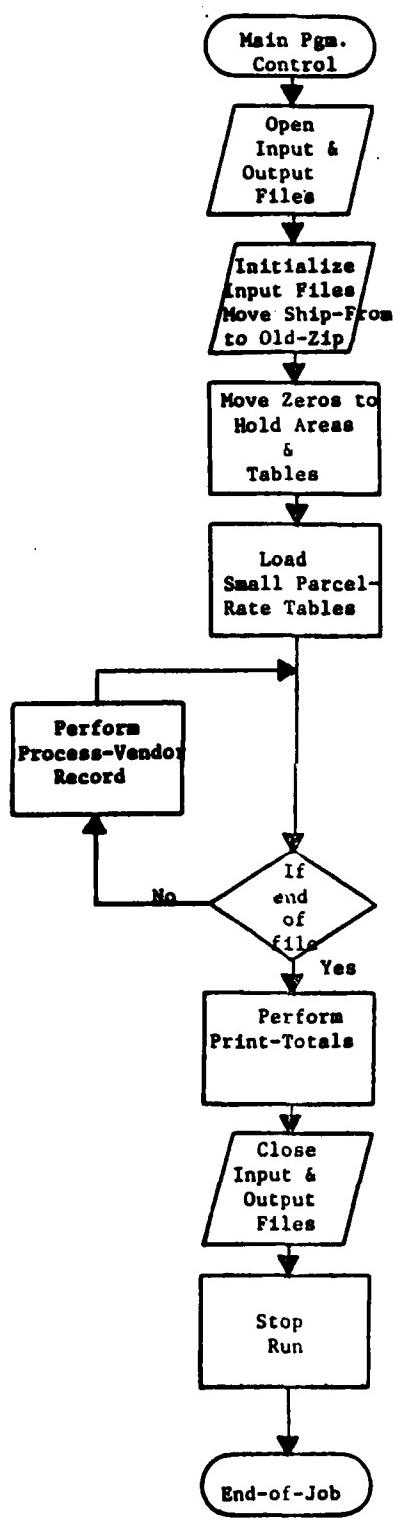
FIGURE 4.b. Process Vendor Record Paragraph

```
                              ┌─────────────┐
                              │  Process    │
                              │Vendor Record│
                              └──────┬──────┘
                                     │
                              ┌──────▼──────┐
                              │Move zip-in to│
                              │   New-Zip   │
                              │             │
                              │  Ship-From  │
                              └──────┬──────┘
  ┌─────────────┐                   │
  │Reload rate  │              ┌────▼────┐
  │  Tables     │      No      │   If    │
  │Move New-Zip │◄─────────────┤ New-Zip │
  │ to Old-Zip  │              │    =    │
  └─────────────┘              │ Old-Zip │
                               └────┬────┘
                                    │ Yes
                              ┌─────▼───────┐
                              │Move Depot-Zip│
                              │     to      │
                              │Ship-to-depot│
                              └──────┬──────┘
                                     │
                              ┌──────▼──────┐
                              │    Zero     │
                              │  Cumulators │
                              └──────┬──────┘
                                     │
                              ┌──────▼──────┐
                              │    Move     │
                              │Number-Points│
                              │     to      │
                              │   Limit1    │
                              └──────┬──────┘
                              ┌──────▼──────┐
                              │    Set      │
                              │   Depot     │
                              │  Subscript  │
                              └──────┬──────┘
                                     │
                                ┌────▼────┐
                       Yes      │   If    │      No
              ┌─────────────────┤  Small  ├─────────────────┐
              │                 │  Parcel │                 │
              │                 └─────────┘                 │
       ┌──────▼──────┐                              ┌──────▼──────┐
       │  Perform    │                              │  Perform    │
       │  Process    │                              │  Process    │
       │Small-Parcel │                              │LTL-Shipment │
       └──────┬──────┘                              └──────┬──────┘
              │                    ◯                       │
              └────────────────────┬────────────────────┘
                              ┌─────▼───────┐
                              │  Perform    │
                              │   Read-     │
                              │Vendor-Record│
                              └──────┬──────┘
                              ┌──────▼──────┐
                              │   Return    │
                              └─────────────┘
```

11
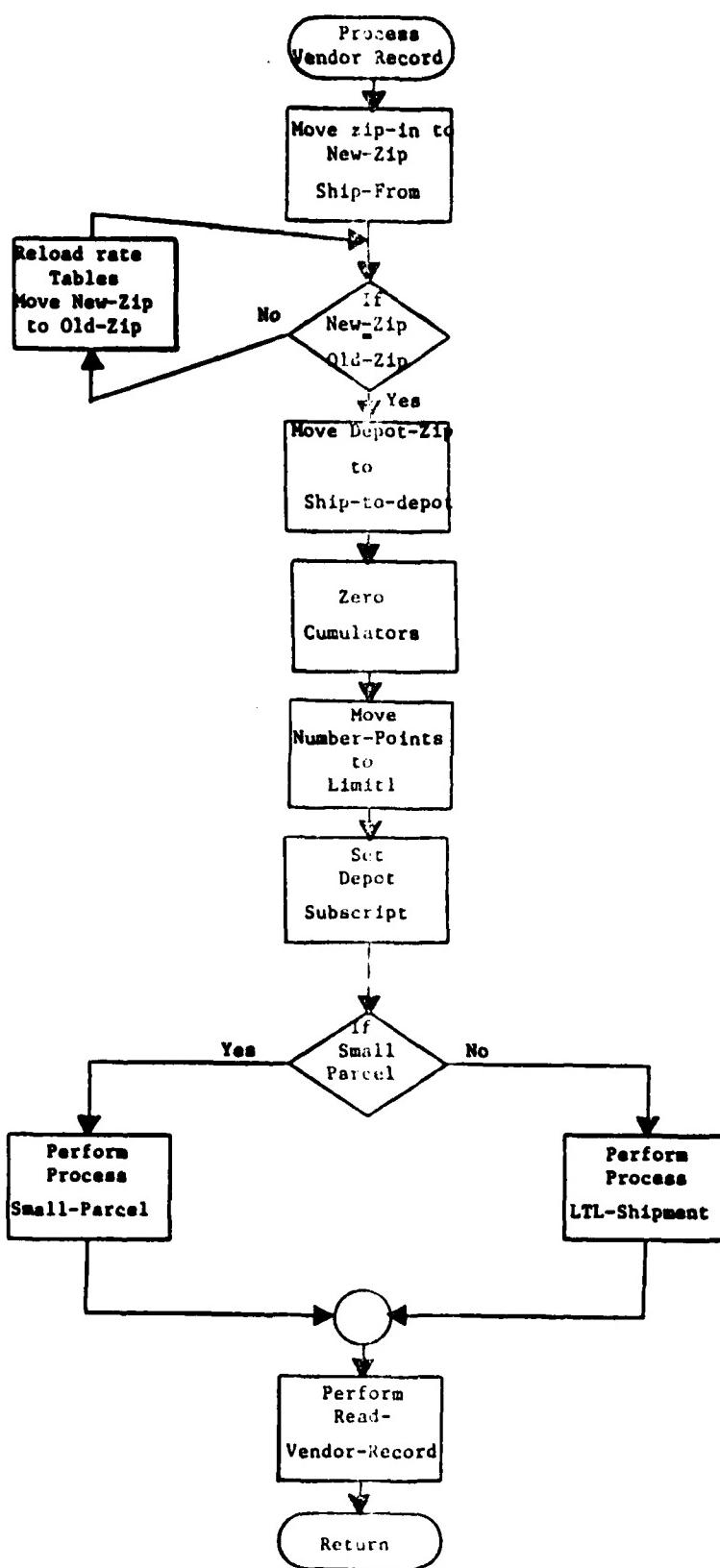
FIGURE 4.c. Process-Small-Parcel Paragraph

```
              ( Process        )
              ( Small-Shipment )
                    |
                    v
           +------------------+
           | Add .5 to Ship   |
           |     Wgt-in       |
           | Set Wgt-Index    |
           +------------------+
                    |
                    v
           +------------------+
           |   Search table   |
           | for PP zone      |
           | Set Zone-Index   |
           +------------------+
                    |
                    v
           +------------------+
           |      Move        |
           |  Direct-Cost     |
           |      to          |
           |  Hold Area       |
           +------------------+
                    |
  +------------+    |
  |  Perform   |    |
  | Rate-all-Points |
  +------------+    |
        ^           v
        |        /     \
        |  Yes  / Point  \
        +------<  Index <  >
                \ Num-Points/
                 \        /
                    | No
                    v
                 /      \
                /  Sort  \
               /  Rates   \
               \  Low to  /
                \  High  /
                    |
                    v
           +------------------+
           |     Select       |
           |    Low rate      |
           |  Cons. Point     |
           +------------------+
                    |
                    v
           +------------------+
           |    Perform       |
           |   Compute-       |
           |    Totals        |
           +------------------+
                    |
                    v
              (   Return   )
```

12
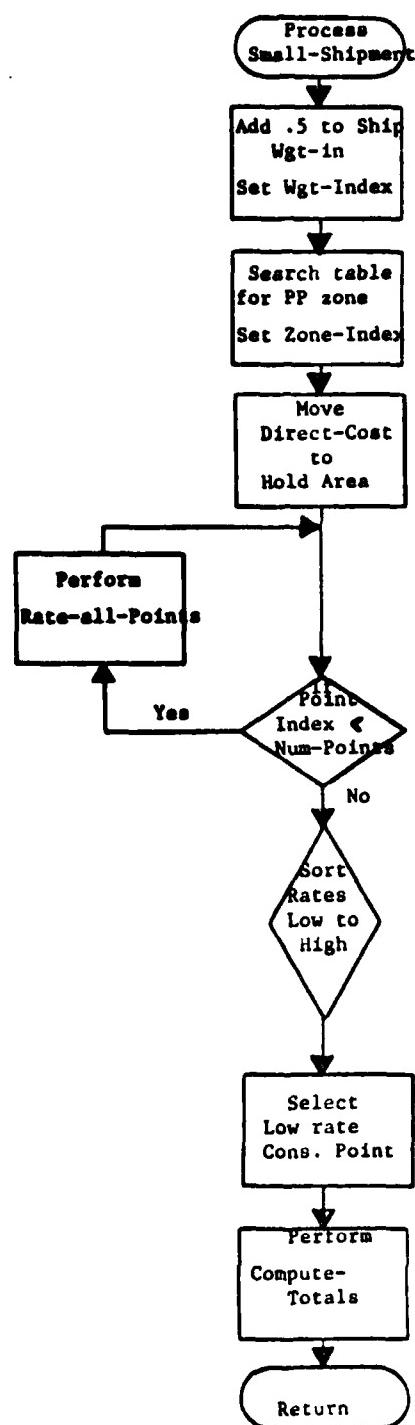
FIGURE 4.d. Process-LTL-Shipment Paragraph

```
                    ┌─────────────┐
                    │   Process   │
                    │ LTL-Shipment│
                    └──────┬──────┘
                           ▼
                    ┌─────────────┐
                    │Set wgt bracket│
                    │Set next higher│
                    │ wgt bracket  │
                    └──────┬──────┘
                           ▼
                    ┌─────────────┐
                    │Divide Shp-wgt│
                    │   by 100    │
                    │set wgt category│
                    └──────┬──────┘
                           ▼
                         ╱ If ╲
                No ◄────╱Intrastate╲────► Yes
              │          ╲        ╱          │
              ▼            ╲    ╱            ▼
     ┌────────────────┐              ┌────────────────┐
     │Search rate table│             │Compute direct  │
     │for correct rate │             │   shipment     │
     │Extend rate      │             │cost estimate   │
     └────────┬────────┘             └────────┬───────┘
              │            ○ ◄────────────────┘
              └───────────►│
                           ▼
                    ┌─────────────┐
                    │    Move     │
                    │Direct-Cost to│
                    │  Hold-Area  │
                    └──────┬──────┘
     ┌────────────────┐    │
     │   Perform      │    │
     │Process-Consol- │    │
     │idation-Point-  │    │
     │Ship-Costs      │    │
     └────────┬───────┘    ▼
              │         ╱ If ╲
       Yes ◄──┴────────╱Point-Index╲
                        ╲  <       ╱
                        ╲Num-Points╱
                           │
                          No
                           ▼
                         ╱Sort╲
                        ╱Rates ╲
                        ╲ Low  ╱
                         ╲to  ╱
                         ╲High╱
                           ▼
                    ┌─────────────┐
                    │   Perform   │
                    │Compute-Totals│
                    └──────┬──────┘
                           ▼
                    ┌─────────────┐
                    │   Display   │
                    │    Rates    │
                    └──────┬──────┘
                           ▼
                    ┌─────────────┐
                    │   Return    │
                    └─────────────┘
```

13

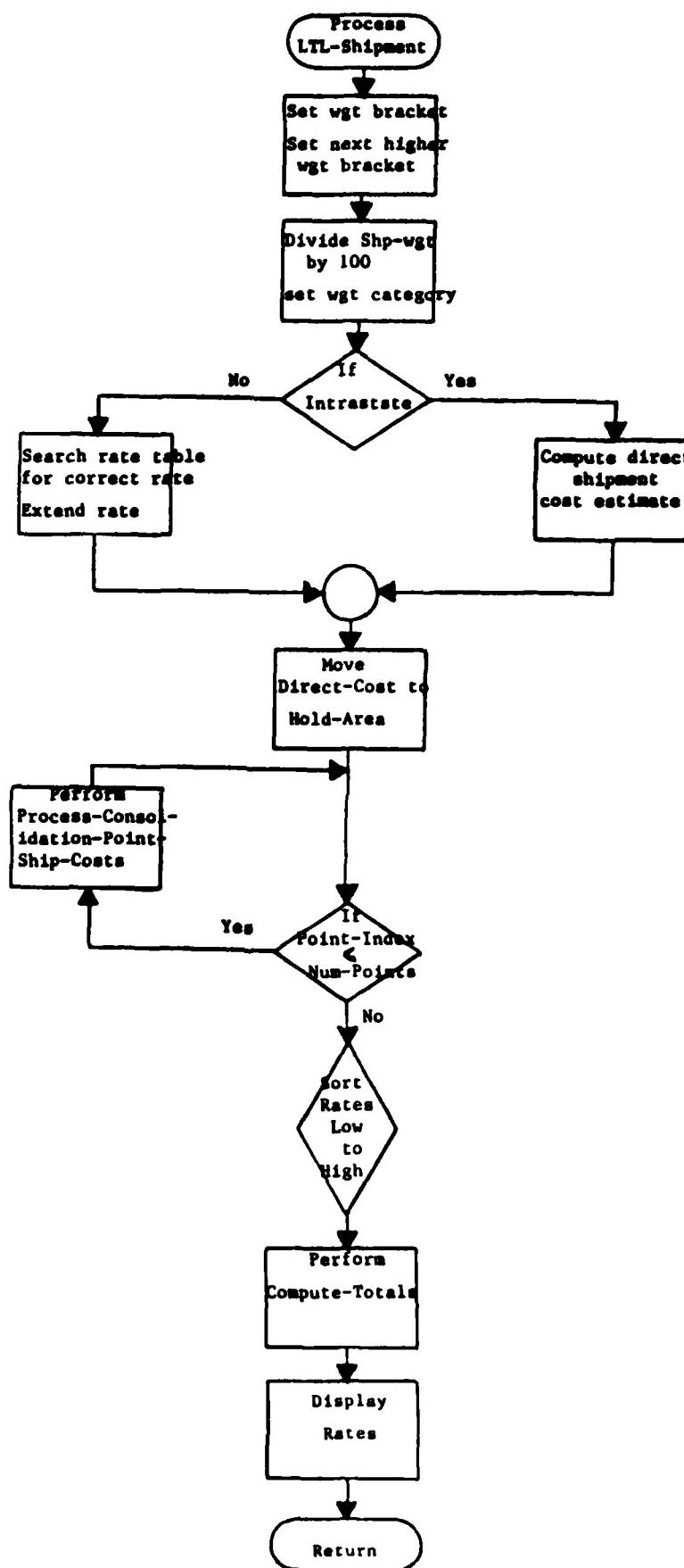# TABLE 3 INDIVIDUAL POINT ANALYSIS

DISTRIBUTION POINT: Los Angeles, CA

	Mechanicsburg	Tracy	Columbus	DESTINATION DEPOT Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
DIRECT DELIVERY COST ESTIMATE							
Wgt	2,993,993	3,625,298	1,637,601	4,796,425	1,282,499 ·	2,567,399	16,903,215
Count	9,455	9,293	12,721	15,083	10,203	21,873	78,628
Cost	$1,019,055	$365,965	$576,211	$1,374,537	$452,367	$491,112	$4,279,247
CONSOLIDATION COSTS							
INBOUND COST ESTIMATE							
Wgt	2,993,993	3,625,298	1,637,601	4,796,425	1,282,499	2,567,399	16,903,215
Count	9,455	9,293	12,721	15,083	10,203	21,873	78,628
Cost	$199,279	$231,891	$149,440	$337,647	$97,360	$215,642	$1,231,259
CONSOLIDATION COST ESTIMATE							
Factor per CWT 1.35	$40,419	$48,942	$22,108	$64,752	$17,314	$34,660	$228,193
OUTBOUND COST ESTIMATE							
Rate Factor	0.78	1.02	0.90	0.79	0.86	1.30	
#Truckloads	99.80	120.84	54.59	159.88	64.12	85.58	
TL Weight	30,000	30,000	30,000	30,000	20,000	30,000	
Miles	2504	308	2225	1795	2599	718	
Total Cost	$201,148	$37,964	$109,310	$226,719	$143,328	$79,880	$798,350
TOTAL CONSOLIDATION COST ESTIMATE							
	$440,846	$318,797	$280,857	$629,118	$258,002	$330,182	$2,257,802

COST ANALYSIS

COST DIFFERENCE	
Consolidation - Direct	($2,021,445)
BREAKEVEN POINT	
Consolidation Factor	13.31

14

estimate shows a breakdown of the estimated cost, weight, and number of shipments that would be handled through the Los Angeles, CA, point. This estimate is based on the estimated commercial cost to ship from the vendor source to each of the six DLA depots directly. This part is representative of multiple nonconsolidated LTL shipments shipped by vendor sources.

b. Consolidation Cost Estimate. The consolidation cost estimate shows statistics for the three steps in the consolidation process. First, the estimated overall costs of shipping items from the vendor source to the lowest cost consolidation point are shown by destination depot. These numbers represent a number of non-consolidated LTL shipments made by vendors to the lowest cost consolidation point. Second, the estimated cost to consolidate the LTL shipments into truckload lots is shown in cost per hundred weight. A factor of $1.35 per hundred weight is used at all points. Finally, the cost to ship the truckload lots to each of the DLA depots is summarized. The rate factor used comes from the existing guaranteed traffic agreement in effect and the miles are from the Household Goods Carriers' Bureau National 3-Digit Zip Code Mileage Guide No. 1. The number of truckloads is computed by dividing 30,000 pounds into the total estimated shipping weight. If 52 truckloads are not available, at least one truckload per week, then the weight per truckload is reduced in 5,000 pound increments and recomputed until 52 loads or a 10,000 pound minimum truckload lot is reached. Total cost is then computed by multiplying the rate by the weight by the number of truckloads.

c. Cost Analysis. The cost analysis computes the difference between the cost to ship direct from vendor to depot versus the cost to consolidate and ship to the depot. In addition, the breakeven point for the consolidation factor is computed. This number represents the cost of consolidation (i.e., currently $13.31 for Los Angeles, CA) at which the cost to ship direct and the cost to consolidate and ship are equal. Within the entire consolidation process the cost of consolidation appears to be the one factor where cost savings can most easily be obtained. By taking the breakeven factor and subtracting the estimated cost to consolidate and then multiplying the result by the number of hundred weight consolidated, the amount of estimated savings or loss can be computed.

d. Total System Cost. The total system cost section of the program is shown in Table 4. It summarizes the total overall weight, cost, and count for vendor to depot direct shipments versus the cost to consolidate and ship on a system-wide basis. Tallies are shown for the cost of direct delivery and for consolidation. Included for each consolidation point is a summary of the individual point analyses. At the bottom of the summary a system-wide cost difference is computed. It is the net of the sum of the direct cost versus consolidation. A bracketed or negative value means that consolidation produces a net savings over direct shipment. Total system and individual point analyses are shown in Appendix B.

TABLE 4 TOTAL SYSTEM ANALYSIS

TOTAL CONSOLIDATION SYSTEM COST ANALYSIS

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
TOTAL DIRECT DELIVERY COST ESTIMATE							
TTL Wgt	49,556,551	50,341,169	20,371,635	69,095,135	34,553,287	28,953,322	252,871,099
TTL Count	88,019	79,873	86,763	113,639	126,696	169,002	663,992
TTL Cost	$7,254,277	$14,863,366	$3,423,077	$11,570,911	$5,248,485	$8,049,487	$50,409,603

CONSOLIDATION COSTS	FACTOR	BREAKEVEN	WEIGHT	COUNT	COST VIA CONSOLIDATION	DIRECT COST	CONS. COST - DIRECT COST
Place Holder	0.00	0.00	0	0	$0	$0	$0
Tracy, CA	1.35	(3.38)	2,375,524	12,243	$779,116	$666,641	$112,475
Los Angeles, CA	1.35	13.31	16,903,215	78,628	$2,257,802	$4,279,247	($2,021,445)
Salt Lake City, UT	1.35	(0.29)	721,085	6,946	$173,719	$161,905	$11,814
Dallas, TX	1.35	10.73	9,397,552	38,932	$1,286,814	$2,167,914	($881,100)
Kansas City, MO	1.35	3.99	9,422,965	15,222	$1,454,506	$1,703,024	($248,518)
Indianapolis, IN	1.35	3.26	6,210,353	35,387	$1,566,070	$1,684,498	($118,428)
Chicago, IL	1.35	6.59	21,211,669	21,162	$2,765,672	$3,876,487	($1,110,815)
Memphis, TN	1.35	2.71	8,594,969	17,065	$1,225,528	$1,342,500	($116,972)
Chatanooga, TN	1.35	4.47	33,501,500	31,405	$4,402,659	$5,449,414	($1,046,755)
Columbus, OH	1.35	6.26	30,239,130	131,140	$4,035,294	$5,520,714	($1,485,420)
Richmond, VA	1.35	7.22	17,201,859	29,867	$2,222,590	$3,231,795	($1,009,205)
Harrisburg, PA	1.35	6.05	25,852,799	37,659	$4,003,673	$5,218,688	($1,215,015)
Secaucus, NJ	1.35	8.32	71,238,479	208,336	$10,143,410	$15,106,776	($4,963,366)
Place holder	0.00	0.00	0	0	$0	$0	$0
TOTAL			252,871,099	663,992	$36,316,853	$50,409,603	($14,092,750)

TOTAL COST DIFFERENCE
    Consolidation-direct   ($14,092,750)

III. ANALYSIS AND OBSERVATIONS

In the original request for the study DLA-OT asked that the best
combination of consolidation points be selected for analysis. This was to
be accomplished by starting with between 10 and 15 points and conducting
an analysis to select the combination and location of CONUS points to maximize
the overall cost savings of consolidation, if any. This approach was later
revised to include approximately 10 to 13 points - 6 of which were to be
cities at or near the existing DLA depots. This was done since it was
assumed that the depots would be competing with commercial contractors to
become consolidation points.

    A. Selection of the Consolidation Points. Thirteen points were
selected for analysis based on the accessibility by major highways, the
availability of transportation services, and the concentration of weight
(see Figure 2) or the fact that they were located at or near a DLA depot.
Analysis was limited to these 13 points by DLA-OT after a briefing on the
initial results. Selection of the best combination and location of
points was deferred to a later study, therefore delaying the finding of the
maximum benefits potentially achievable under EDDS. The points are as
follows (points at or near a depot are indicated by an *):

            (1) Tracy, CA*
            (2) Los Angeles, CA
            (3) Salt Lake City, UT*
            (4) Dallas, TX
            (5) Kansas City, MO
            (6) Indianapolis, IN
            (7) Chicago, IL
            (8) Memphis, TN*
            (9) Chattanooga, TN
            (10) Columbus, OH*
            (11) Richmond, VA*
            (12) Harrisburg, PA*
            (13) Secaucus, NJ

    B. Analysis Results. The results of the cost comparison analysis
are shown in Table 4, Total Consolidation System Cost Analysis. The
data indicate that a total of 663,992 shipments weighing less than 10,000
pounds were selected and analyzed. These shipments have a total aggregate
weight of 252,871,099 pounds. Cost for direct delivery of these shipments
is estimated to be $50,409,603 for both parcel post and LTL movements while
cost for consolidation and shipment of this same freight is estimated to
be $36,316,853 using the above 13 points. These are system-wide
estimates with projected savings using consolidation of $14,092,750. In
reviewing the individual points it is interesting to note that there are at
least two points where direct delivery is less costly than consolidation -
Tracy, CA, and Salt Lake City, UT. All of the other points show savings
through consolidation ranging from a low of $116,972 at Memphis, TN, to a
high of $4,963,366 at Secaucus, NJ. The savings appear to be directly
related to the amount of tonnage originating in the surrounding area. See
Figure 2 for a plot of the points against weight categories.

C. Observations

Under the total system concept losses by individual points seem to be inherent in the system. This problem could probably be eliminated by changing or removing those points producing little or no savings. It was not done in this analysis since the points showing losses were located at or near DLA depots - points that were to be specifically included. Removal or change of a point located at or near a DLA depot causes another potential problem called a backhaul. An example of a backhaul would be if a vendor located in Portland, OR, was forced to ship an item destined for Tracy, CA, (located about 100 miles east of San Francisco, CA) to the consolidation point at Los Angeles, CA, (about 375 miles south of Tracy, CA) for consolidation and shipment back to Tracy, CA. In this instance the shipment will travel about 750 miles farther and may take one to two more days in travel time. There appears to be no way to eliminate the backhaul problem if the total system concept is used.

o There appears to be a number of benefits inherent in the consolidation of LTL shipments. Some of them are listed below along with brief explanations.

oo **Increase Competition Among Vendors.** Under the total system concept vendors will bid to the consolidation point of their choosing, usually the one which produces the lowest overall transportation cost. Since there will be a number of points located throughout CONUS to choose from, vendors should be able to reduce the amount of transportation related costs included in the bid price of the item. This will increase the opportunity to compete by vendors who otherwise may have had to ship long distances at greatly increased transportation costs - the transportation costs being the difference between getting the contract or not. Under the total system consolidation concept, DLA will pay the cost of consolidation and shipping to the depots. The reduction in the transportation costs paid by the vendor plus the reduced cost of consolidation and shipping in truckload lots versus what would have been paid if the item had been shipped direct to the depot should be reflected as a savings to DLA.

oo **More Small-Dollar Contracts Bidding F.O.B. Destination.** The advantage of an F.O.B. destination bid is that the transportation costs are a part of the cost of an item. So, when evaluating a bid the lowest laid down cost is all that needs to be reviewed. If, however, both F.O.B. origin and destination bids are received for an item, the transportation cost of shipping the F.O.B. origin bid would have to be researched and estimated on a per item basis. This can sometimes require that the per item rate be extended to seven or more decimal places. This process does not ensure that the estimated rate is what is actually paid when the item is shipped.

oo **Increase Item Visibility.** Usually advance notice of the arrival of an item at a depot is not given by the vendor. Under consolidation, however, an item will be received at the consolidation point before it is consolidated with other items for final shipment in a truckload lot to the consignee depot. During the process of building a truckload, a manifest listing the items by quantity and NSN will be

18

constructed and transmitted to the depot in advance of shipment. This
will allow the receiving depot the opportunity to schedule for receipts.
In addition, mission critical items could be diverted direct to the
customer by premium transportation mode.

        oo <u>Opportunity for Negotiation.</u> With consolidation, the
competition among vendors wishing to provide the consolidation service
should be keen, allowing for negotiation of the best possible price. Also
negotiation for dedicated truck service from the consolidation points to
the six DLA depots should result in favorable truckload rates. Negotiation
in both areas should result in substantial savings to DLA.

        oo <u>Lower Overall Costs.</u> The total system consolidation concept
will result in an overall lower cost to DLA. Initial results show a
projected savings of more than $14 million per year. This may be a
conservative estimate since much of the data on small shipments may have
been lost in the collection process. Variations in the number and
selection of consolidation points could also have a direct effect on
savings potential.

     o In addition to the potential benefits of consolidation some potential
problems were observed, they are:

        oo <u>Implementation Time Lag.</u> Should implementation of the total
system concept be adopted, traffic flow into the consolidation points will
be slow at first and then will build up gradually. This will be the result
of a lag in the time needed to change or amend contracts to read F.O.B.
destination to the nearest consolidation point. Since low traffic volumes
may not allow for the building of full truckloads to each depot on a weekly
basis, LTL shipments will result. This may result in initial startup costs
significantly exceeding the previous costs.

        oo <u>Consolidation Point Processing Equipment.</u> The consolidation
points will be processing a large number of shipments each day. To do this,
some form of computerization will be needed. This will require equipment
compatibility between consolidation points and depots. Since contractor
operations are proposed, standards will have to be established.

        oo <u>Hold Time or Maximum Consolidation Time.</u> Since it is
essential that inbound freight not be delayed, standards or rules regarding
the maximum time a shipment will remain at a consolidation point must be
established. This should include instructions for the shipment of small
lots of freight which cannot be built into truckload lots within the
required timeframe.

        oo <u>Expediting or Rerouting of High-Priority Freight.</u> If
diversion of high-priority shipments is part of the consolidation point
service, criteria for identifying such shipments must be established. A
payment structure for handling and shipment must also be defined.

oo <u>Lost and Damaged Freight at Consolidation Points.</u> Rules and
procedures to cover loss or damage of freight at the consolidation points
must be considered. This is essential because the contractor at each
consolidation point will be acting as an agent for DLA in receipt of
freight from vendors.

IV. <u>RECOMMENDATION</u>

<u>Implement the EDDS Concept on a System-Wide Basis Within DLA.</u>

o Following are several key insights gained during this study:

oo Results of the analysis comparing direct vendor delivery to
consolidation on a total system basis within DLA shows a potential savings
of approximately $14,000,000. A change in the number and/or location of
the consolidation points could increase or decrease the savings potential.

oo Location of consolidation points at or near DLA depots,
especially the depots located at or west of the Mississippi River, tend to
result in small or negative savings.

oo Larger savings tend to occur when consolidation points are
located in areas where large amounts of tonnage originate. This is based
on the historical data generated under the current system.

oo A number of potential benefits can be expected if
consolidation is implemented on a total system basis. They are increased
competition, F.O.B. destination bids for all small-purchase contracts,
increased item visibility, opportunity for negotiation of consolidation and
truck rates, and lower overall costs.

oo Several potential problems can be expected if consolidation is
implemented on a total system basis. They are implementation time lag
resulting in higher initial costs, standardization of consolidation point
data processing, and the implementation of rules governing maximum hold
time, expediting high priority items, and loss and damage at the
consolidation points.

Several recommendations for further analysis include:

1. Further study to determine the number and location of
consolidation points which result in a maximum cost savings to DLA. This
could be done using the existing computer models.

2. A study should be initiated to explore the feasibility of
utilizing the consolidation points for local distribution of second
destination depot freight. A good example of this concept may be the
building of a truckload consisting of small shipments from several east
coast DLA depots destined to points in California. The truckload would be

shipped at low truckload rates to a consolidation point in California, where it will be distributed to customers as small parcel or LTL shipments.

      3. If initiated and considered successful, the possibility of all services utilizing a system of CONUS consolidation points should be reviewed. This concept could result in savings well into the multi-millions of dollars to DoD.

      4. Finally, if implemented, the consolidation system should be re-evaluated prior to issuing new contracts. This will enable managers to make a decision as to the value of retaining, changing, or eliminating the system based on actual performance and cost data.

Appendix A

Intrastate Rate Formula Development

Appendix A

INTRASTATE RATE FORMULA DEVELOPMENT

I. INTRODUCTION

Rates covering shipments for LTL shipments to and from intrastate points
were not readily available for this study. This was due to the fact that
some states are deregulated and few, if any, rates are published for those
states. In addition, only a handful of collection points maintain the
rates collectively for all states. The possibility of obtaining the
existing intrastate rates on magnetic tape was explored and was found to
be costly and time consuming. So the use of linear approximation, an
alternative to actual rates, was used.

II. METHODOLOGY

The methodology utilized to develop rate approximation equations was
relatively straightforward and includes the steps explained below. In
order to capture the differences in rates between states and points within
each state, a unique equation was developed for each consolidation point
analyzed.

   A. **Sampling Shipment Data.** Three-digit sectional zip codes were
used to identify vendor shipping points. To identify high volume points
the shipment weight by line item was aggregated by individual state, then
by point within each state. The totals were then sorted in descending
order by point within each state. Once this was done, all points having
more that 100,000 pounds were selected and used as observations in
building the regression model. If not enough points were found with more
than the 100,000 weight limit (three or less), zip codes were selected
until there was a 50 percent difference between the weight of the selected
zip code and the next lower weight point.

   B. **Intrastate Rates.** Rates between the origin/destination (OD)
pairs for selected weight categories between 0 and 10,000 pounds were
obtained using a commercial rate database called Numerax IV. If possible,
Class 77.5 were used, in all other cases the available intrastate rate was
used. This was a time consuming process since each OD pair had to be
looked up separately.

   C. **Regression Analysis.** Linear regression was used to develop an
intrastate rate approximation equation for each consolidation point. To
develop an equation, a test dataset of weights was established containing
incremental weights between 0 and 10,000 pounds. These weights were then
used to compute costs for each incremental weight using the rates obtained
from Numerax IV. The computed rates were then run through a statistical
package which performed a regression analysis resulting in a linear
equation. This equation was then assumed to be representative of the cost
to make an intrastate shipment to a particular consolidation point. R-
square values (an indicator of an equation's predicting accuracy) ranged
from .5831 to .9736, with a value of 1 indicating perfect predictability.

D. Testing. Each equation was tested against the actual data used to develop it. For example, initial costs were generated by using the control weight dataset and actual rates. Estimated costs were computed using the linear equation and the control weight dataset. Using a sum of the results, differences were computed which resulted in the estimated costs varying within a range of plus or minus 16 percent about the actual rate computation.

Appendix B

Total System and Individual Point Analyses

TOTAL CONSOLIDATION SYSTEM COST ANALYSIS

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	· Ogden	TOTAL ALL DEPOTS

TOTAL DIRECT DELIVERY COST ESTIMATE

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
Wgt	49,556,551	50,341,169	20,371,635	69,095,135	34,553,287	28,953,322	252,871,099
Count	88,019	79,873	86,763	113,639	126,696	169,002	663,992
Cost	$7,254,277	$14,863,366	$3,423,077	$11,570,911	$5,248,485	$8,049,487	$50,409,603

CONSOLIDATION COSTS

	FACTOR	BREAKEVEN	WEIGHT	COUNT	COST VIA CONSOLIDATION	DIRECT COST	CONS. COST - DIRECT COST
Place Holder	0.00	0.00	0	0	$0	$0	$0
Tracy, CA	1.35	(3.38)	2,375,524	12,243	$779,116	$666,641	$112,475
Los Angeles, CA	1.35	13.31	16,903,215	78,628	$2,257,802	$4,279,247	($2,021,445)
Salt Lake City, UT	1.35	(0.29)	721,085	6,946	$173,719	$161,905	$11,814
Dallas, TX	1.35	10.73	9,397,552	38,932	$1,286,814	$2,167,914	($881,100)
Kansas City, MO	1.35	3.99	9,422,965	15,222	$1,454,506	$1,703,024	($248,518)
Indianapolis, IN	1.35	3.26	6,210,353	35,387	$1,566,070	$1,684,498	($118,428)
Chicago, IL	1.35	6.59	21,211,669	21,162	$2,765,672	$3,876,487	($1,110,815)
Memphis, TN	1.35	2.71	8,594,969	17,065	$1,225,528	$1,342,500	($116,972)
Chatanooga, TN	1.35	4.47	33,501,500	31,405	$4,402,659	$5,449,414	($1,046,755)
Columbus, OH	1.35	6.26	30,239,130	131,140	$4,035,294	$5,520,714	($1,485,420)
Richmond, VA	1.35	7.22	17,201,859	29,867	$2,222,590	$3,231,795	($1,009,205)
Harrisburg, PA	1.35	6.05	25,852,799	37,659	$4,003,673	$5,218,688	($1,215,015)
Secaucus, NJ	1.35	8.32	71,238,479	208,336	$10,143,410	$15,106,776	($4,963,366)
Place holder	0.00	0.00	0	0	$0	$0	$0
TOTAL			252,871,099	663,992	$36,316,853	$50,409,603	($14,092,750)

TOTAL COST DIFFERENCE

Consolidation-direct   ($14,092,750)

DISTRIBUTION POINT: Los Angeles, CA

| | DESTINATION DEPOT | | | | | | |
	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
DIRECT DELIVERY COST ESTIMATE							
Wgt	2,993,993	3,625,298	1,637,601	4,796,425	1,282,499	2,567,399	16,903,215
Count	9,455	9,293	12,721	15,083	10,203	21,873	78,628
Cost	$1,019,055	$365,965	$576,211	$1,374,537	$452,367	$491,112	$4,279,247
CONSOLIDATION COSTS							
INBOUND COST ESTIMATE							
Wgt	2,993,993	3,625,298	1,637,601	4,796,425	1,282,499	2,567,399	16,903,215
Count	9,455	9,293	12,721	15,083	10,203	21,873	78,628
Cost	$199,279	$231,891	$149,440	$337,647	$97,360	$215,642	$1,231,259
CONSOLIDATION COST ESTIMATE							
Factor per CWT 1.35	$40,419	$48,942	$22,108	$64,752	$17,314	$34,660	$228,193
OUTBOUND COST ESTIMATE							
Rate Factor	0.78	1.02	0.90	0.79	0.86	1.30	
#Truckloads	99.80	120.84	54.59	159.88	64.12	85.58	
TL Weight	30,000	30,000	30,000	30,000	20,000	30,000	
Miles	2584	308	2225	1795	2599	718	
Total Cost	$201,148	$37,964	$109,310	$226,719	$143,328	$79,880	$798,350
TOTAL CONSOLIDATION COST ESTIMATE							
	$440,846	$318,797	$280,857	$629,118	$258,002	$330,182	$2,257,802

COST ANALYSIS

COST DIFFERENCE
Consolidation - Direct   ($2,021,445)
BREAKEVEN POINT
Consolidation Factor   13.31

FACTORS

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden
CONSOLIDATION POINT WEIGHT:	1	1	1	1	1	1
WEIGHT : RATE:	1	1	1	1	1	1
RATE : GTP:	1	1	1	1	1	1

DISTRIBUTION POINT: Tracy, CA

	Mechanicsburg	Tracy	Columbus	DESTINATION DEPOT Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
DIRECT DELIVERY COST ESTIMATE							
Wgt	467,384	578,978	208,017	456,820	335,852	328,473	2,375,524
Count	1,559	1,417	1,628	1,422	2,584	3,633	12,243
Cost	$165,929	$92,193	$70,676	$143,051	$125,801	$68,991	$666,641
CONSOLIDATION COSTS							
INBOUND COST ESTIMATE							
Wgt	467,384	578,978	208,017	456,820	335,852	328,473	2,375,524
Count	1,559	1,417	1,628	1,422	2,584	3,633	12,243
Cost	$79,370	$92,193	$36,564	$76,946	$58,798	$63,145	$407,016
CONSOLIDATION COST ESTIMATE							
Factor per-CWT 1.35	$6,310	$7,816	$2,808	$6,167	$4,534	$4,434	$32,070
OUTBOUND COST ESTIMATE							
Rate Factor	0.78	200.00	0.90	0.78	0.85	1.30	
#Truckloads	46.74	57.90	20.80	45.68	33.59	32.85	
TL Weight	10,000	10,000	10,000	10,000	10,000	10,000	
Miles	2722	1	2389	2016	2820	753	
Total Cost	$99,233	$11,580	$44,726	$71,834	$80,504	$32,154	$340,030
TOTAL CONSOLIDATION COST ESTIMATE							
	$184,913	$111,589	$84,098	$154,947	$143,836	$99,734	$779,116

COST ANALYSIS

COST DIFFERENCE							
Consolidation - Direct	$112,475						
BREAKEVEN POINT							
Consolidation factor	-3.38						

FACTORS

CONSOLIDATION POINT WEIGHT:	1	1	1	1	1	1	
WEIGHT 1 RATE:	1	1	1	1	1	1	
RATE 1 GTP:	1	1	1	1	1	1	

DISTRIBUTION POINT: Salt Lake City, UT

				DESTINATION DEPOT			
	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
DIRECT DELIVERY COST ESTIMATE							
Wgt	117,435	157,876	56,923	164,698	106,364	117,789	721,085
Count	685	713	1,207	1,150	1,156	2,035	6,946
Cost	$33,943	$27,228	$18,553	$39,970	$30,051	$12,160	$161,905
CONSOLIDATION COSTS							
INBOUND COST ESTIMATE							
Wgt	117,435	157,876	56,923	164,698	106,364	117,789	721,085
Count	685	713	1,207	1,150	1,156	2,035	6,946
Cost	$12,681	$14,255	$5,287	$15,338	$13,627	$8,285	$69,473
CONSOLIDATION COST ESTIMATE							
Factor per CWT 1.35	$1,585	$2,131	$768	$2,223	$1,436	$1,590	$9,735
OUTBOUND COST ESTIMATE							
Rate Factor	1.20	0.97	0.95	0.95	0.90	200.00	
#Truckloads	11.74	15.79	5.69	16.47	10.64	11.78	
TL Weight	10,000	10,000	10,000	10,000	10,000	10,000	
Miles	1999	723	1666	1520	2102	1	
Total Cost	$28,170	$11,072	$9,009	$23,782	$20,122	$2,356	$94,512
TOTAL CONSOLIDATION COST ESTIMATE							
	$42,437	$27,458	$15,065	$41,344	$35,185	$12,231	$173,719

COST ANALYSIS

COST DIFFERENCE							
Consolidation - Direct	$11,814						
BREAKEVEN POINT							
Consolidation Factor	-0.29						

FACTORS							
CONSOLIDATION POINT WEIGHT:	1	1	1	1	1	1	
WEIGHT 1 RATE:	1	1	1	1	1	1	
RATE 1 GTP:	1	1	1	1	1	1	

DISTRIBUTION POINT: Dallas, TX

				DESTINATION DEPOT			
	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
DIRECT DELIVERY COST ESTIMATE							
Wgt	1,018,355	1,978,591	1,638,522	2,607,873	893,418	1,260,793	9,397,552
Count	3,124	5,039	8,280	9,215	3,934	9,340	38,932
Cost	$261,288	$526,850	$401,365	$456,597	$212,874	$308,940	$2,167,914
CONSOLIDATION COSTS							
INBOUND COST ESTIMATE							
Wgt	1,018,355	1,978,591	1,638,522	2,607,873	893,418	1,260,793	9,397,552
Count	3,124	5,039	8,280	9,215	3,934	9,340	38,932
Cost	$71,556	$117,573	$113,781	$169,929	$57,939	$102,831	$633,609
CONSOLIDATION COST ESTIMATE							
Factor per CWT 1.35	$13,748	$26,711	$22,120	$35,206	$12,061	$17,021	$126,867
OUTBOUND COST ESTIMATE							
Rate Factor	0.92	0.97	0.96	1.15	0.92	1.13	
#Truckloads	101.84	65.95	54.62	86.93	89.34	63.04	
TL Weight	10,000	30,000	30,000	30,000	10,000	20,000	
Miles	1373	1646	1026	452	1256	1266	
Total Cost	$128,635	$105,302	$53,796	$45,186	$103,236	$90,183	$526,338
TOTAL CONSOLIDATION COST ESTIMATE							
	$213,938	$249,586	$189,697	$250,321	$173,236	$210,035	$1,286,814

COST ANALYSIS

COST DIFFERENCE
Consolidation - Direct ($881,100)
BREAKEVEN POINT
Consolidation Factor 10.73

FACTORS							
CONSOLIDATION POINT WEIGHT:	1	1	1	1	1	1	
WEIGHT 1 RATE:	1	1	1	1	1	1	
RATE ,1 GTP:	1	1	1	1	1	1	

DISTRIBUTION POINT: Kansas City, MO

	Mechanicsburg	Tracy	Columbus	DESTINATION DEPOT Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
DIRECT DELIVERY COST ESTIMATE							
Wgt	1,391,591	1,908,861	991,022	2,863,499	1,274,335 ·	993,657	9,422,965
Count	2,050	1,519	1,471	2,438	3,597	4,147	15,222
Cost	$256,276	$485,481	$152,195	$344,373	$247,977	$216,722	$1,703,024
CONSOLIDATION COSTS							
INBOUND COST ESTIMATE							
Wgt	1,391,591	1,908,861	991,022	2,863,499	1,274,335	993,657	9,422,965
Count	2,050	1,519	1,471	2,438	3,597	4,147	15,222
Cost	$118,521	$148,566	$85,143	$230,324	$113,337	$95,249	$791,140
CONSOLIDATION COST ESTIMATE							
Factor per CWT 1.35	$18,786	$25,770	$13,379	$38,657	$17,204	$13,414	$127,210
OUTBOUND COST ESTIMATE							
Rate Factor	1.22	0.95	0.97	0.97	1.35	1.38	
#Truckloads	69.58	63.63	99.10	95.45	63.72	99.37	
TL Weight	20,000	30,000	10,000	30,000	20,000	10,000	
Miles	1014	1787	655	449	1062	1066	
Total Cost	$86,075	$108,019	$62,965	$41,571	$91,351	$146,175	$536,156
TOTAL CONSOLIDATION COST ESTIMATE							
	$223,383	$282,355	$161,486	$310,553	$221,891	$254,838	$1,454,506

COST ANALYSIS

    COST DIFFERENCE
    Consolidation - Direct   ($248,518)
    BREAKEVEN POINT
    Consolidation Factor   3.99

FACTORS						
CONSOLIDATION POINT WEIGHT:	1	1	1	1	1	1
WEIGHT 1 RATE:	1	1	1	1	1	1
RATE , 1 GTP:	1	1	1	1	1	1

DISTRIBUTION POINT: Indianapolis, IN

	Mechanicsburg	Tracy	Columbus	DESTINATION DEPOT Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
DIRECT DELIVERY COST ESTIMATE							
Wgt	855,562	955,007	697,839	1,318,043	1,220,039.	1,163,863	6,210,353
Count	4,908	4,140	4,726	5,008	6,821	9,784	35,387
Cost	$198,906	$361,754	$166,660	$261,928	$259,990	$435,260	$1,684,498
CONSOLIDATION COSTS							
INBOUND COST ESTIMATE							
Wgt	855,562	955,007	697,839	1,318,043	1,220,039	1,163,863	6,210,353
Count	4,908	4,140	4,726	5,008	6,821	9,784	35,387
Cost	$149,714	$144,379	$141,085	$191,925	$170,182	$238,003	$1,035,288
CONSOLIDATION COST ESTIMATE							
Factor per CNT							
1.35	$11,550	$12,893	$9,421	$17,794	$16,471	$15,712	$83,840
OUTBOUND COST ESTIMATE							
Rate Factor	1.35	0.95	1.45	1.08	1.26	0.95	
#Truckloads	85.56	95.50	69.78	65.90	61.00	58.19	
TL Weight	10,000	10,000	10,000	20,000	20,000	20,000	
Miles	529	2225	170	526	606	1497	
Total Cost	$61,100	$201,865	$17,202	$37,438	$46,579	$82,759	$446,942
TOTAL CONSOLIDATION COST ESTIMATE							
	$222,364	$359,136	$167,708	$247,156	$233,231	$336,475	$1,566,070

COST ANALYSIS

    COST DIFFERENCE
    Consolidation - Direct   ($118,428)
    BREAKEVEN POINT
    Consolidation Factor   3.26

FACTORS

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden
CONSOLIDATION POINT WEIGHT:	1	1	1	1	1	1
WEIGHT 1 RATE:	1	1	1	1	1	1
RATE 1 GTP:	1	1	1	1	1	1

DISTRIBUTION POINT: Chicago, IL

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
DESTINATION DEPOT							

DIRECT DELIVERY COST ESTIMATE

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
Wgt	3,880,221	4,904,799	1,998,599	5,409,489	2,349,318	2,669,243	21,211,669
Count	2,897	2,936	3,390	4,455	2,668	4,816	21,162
Cost	$606,657	$1,272,023	$262,322	$732,285	$394,459	$608,741	$3,876,487

CONSOLIDATION COSTS

INBOUND COST ESTIMATE

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
Wgt	3,880,221	4,904,799	1,998,599	5,409,489	2,349,318	2,669,243	21,211,669
Count	2,897	2,936	3,390	4,455	2,668	4,816	21,162
Cost	$294,671	$375,695	$183,565	$430,807	$185,190	$244,580	$1,714,508

CONSOLIDATION COST ESTIMATE

Factor per CWT	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
1.35	$52,383	$66,215	$26,981	$73,028	$31,716	$36,035	$286,358

OUTBOUND COST ESTIMATE

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
Rate Factor	1.35	0.96	1.45	1.08	1.26	0.96	
#Truckloads	129.34	163.49	66.62	180.32	78.31	88.97	
TL Weight	30,000	30,000	30,000	30,000	30,000	30,000	
Miles	621	2112	311	528	748	1384	
Total Cost	$108,433	$331,486	$30,042	$102,824	$73,806	$118,215	$764,806

TOTAL CONSOLIDATION COST ESTIMATE

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
	$455,487	$773,396	$240,588	$606,659	$290,712	$398,830	$2,765,672

COST ANALYSIS

COST DIFFERENCE
Consolidation - Direct   ($1,110,815)
BREAKEVEN POINT
Consolidation Factor   6.59

FACTORS

		Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden
CONSOLIDATION POINT WEIGHT:		1	1	1	1	1	1
WEIGHT	1 RATE:	1	1	1	1	1	1
RATE	1 GTP:	1	1	1	1	1	1

DISTRIBUTION POINT: Memphis, TN

				DESTINATION DEPOT			
	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
DIRECT DELIVERY COST ESTIMATE							
Wgt	2,105,674	1,333,294	89,291	3,290,768	1,529,087.	246,855	8,594,969
Count	2,556	2,145	1,576	4,158	3,517	3,113	17,065
Cost	$372,132	$385,184	$16,674	$233,886	$270,280	$64,344	$1,342,500
CONSOLIDATION COSTS							
INBOUND COST ESTIMATE							
Wgt	2,105,674	1,333,294	89,291	3,290,768	1,529,087	246,855	8,594,969
Count	2,556	2,145	1,576	4,158	3,517	3,113	17,065
Cost	$250,430	$97,819	$10,523	$233,886	$139,638	$26,174	$758,470
CONSOLIDATION COST ESTIMATE							
Factor per CWT 1.35	$28,427	$17,999	$1,205	$44,425	$20,643	$3,333	$116,032
OUTBOUND COST ESTIMATE							
Rate Factor	1.15	0.96	0.78	200.00	1.25	1.20	
#Truckloads	70.19	66.66	8.93	109.69	76.45	24.69	
TL Weight	30,000	20,000	10,000	30,000	20,000	10,000	
Miles	921	2016	576	1	804	1515	
Total Cost	$74,341	$129,020	$4,012	$21,938	$76,837	$44,878	$351,026
TOTAL CONSOLIDATION COST ESTIMATE							
	$353,197	$244,839	$15,740	$300,250	$237,117	$74,385	$1,225,528

COST ANALYSIS

COST DIFFERENCE
Consolidation - Direct   ($116,972)
BREAKEVEN POINT
Consolidation Factor   2.71

FACTORS							
CONSOLIDATION POINT WEIGHT:	1	1	1	1	1	1	
WEIGHT 1 RATE:	1	1	1	1	1	1	
RATE 1 GTP:	1	1	1	1	1	1	

DISTRIBUTION POINT: Chatanooga, TN

		DESTINATION DEPOT					
	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
DIRECT DELIVERY COST ESTIMATE							
Wgt	6,213,381	5,686,683	902,667	11,791,864	7,047,398·	1,859,507	33,501,500
Count	4,399	4,174	2,355	9,061	6,890	4,526	31,405
Cost	$960,105	$1,667,166	$164,860	$1,178,427	$952,430	$526,426	$5,449,414
CONSOLIDATION COSTS							
INBOUND COST ESTIMATE							
Wgt	6,213,381	5,686,683	902,667	11,791,864	7,047,398	1,859,507	33,501,500
Count	4,399	4,174	2,355	9,061	6,890	4,526	31,405
Cost	$535,426	$494,561	$133,883	$984,038	$595,264	$206,388	$2,949,560
CONSOLIDATION COST ESTIMATE							
Factor per CWT 1.35	$83,881	$76,770	$12,186	$159,190	$95,140	$25,103	$452,270
OUTBOUND COST ESTIMATE							
Rate Factor	1.15	0.96	0.79	1.05	1.30	1.20	
#Truckloads	207.11	189.56	90.27	393.06	234.91	61.98	
TL Weight	30,000	30,000	10,000	30,000	30,000	30,000	
Miles	649	2325	428	309	532	1380	
Total Cost	$154,579	$423,089	$30,521	$127,529	$162,466	$102,645	$1,000,829
TOTAL CONSOLIDATION COST ESTIMATE							
	$773,885	$994,420	$176,590	$1,270,757	$852,870	$334,136	$4,402,659

COST ANALYSIS

COST DIFFERENCE
Consolidation - Direct   ($1,046,755)
BREAKEVEN POINT
Consolidation Factor   4.47

FACTORS							
CONSOLIDATION POINT WEIGHT:	1	1	1	1	1	1	
WEIGHT : RATE:	1	1	1	1	1	1	
RATE : GTP:	1	1	1	1	1	1	

DISTRIBUTION POINT: Columbus, OH

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
				DESTINATION DEPOT			

DIRECT DELIVERY COST ESTIMATE

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
Wgt	4,790,949	5,493,726	5,758,326	6,604,411	2,219,431 ·	5,372,287	30,239,130
Count	17,160	10,292	14,587	12,761	33,461	42,879	131,140
Cost	$631,793	$1,603,691	$482,516	$992,507	$374,930	$1,435,277	$5,520,714

CONSOLIDATION COSTS

INBOUND COST ESTIMATE

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
Wgt	4,790,949	5,493,726	5,758,326	6,604,411	2,219,431	5,372,287	30,239,130
Count	17,160	10,292	14,587	12,761	33,461	42,879	131,140
Cost	$395,797	$421,403	$482,516	$549,333	$217,948	$496,564	$2,563,561

CONSOLIDATION COST ESTIMATE

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
Factor per CWT 1.35	$64,678	$74,165	$77,737	$89,160	$29,962	$72,526	$408,228

OUTBOUND COST ESTIMATE

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
Rate Factor	1.50	0.94	200.00	1.00	1.35	1.20	
#Truckloads	159.70	183.12	191.94	220.15	73.98	179.08	
TL Weight	30,000	30,000	30,000	30,000	30,000	30,000	
Miles	359	2389	1	576	442	1661	
Total Cost	$85,998	$411,235	$38,389	$126,805	$44,144	$356,935	$1,063,505

TOTAL CONSOLIDATION COST ESTIMATE

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
	$546,472	$906,803	$598,642	$765,297	$292,055	$926,025	$4,035,294

COST ANALYSIS

COST DIFFERENCE
Consolidation - Direct   ($1,485,420)
BREAKEVEN POINT
Consolidation Factor   6.26

FACTORS

		Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden
CONSOLIDATION POINT WEIGHT:		1	1	1	1	1	1
WEIGHT	1 RATE:	1	1	1	1	1	1
RATE	1 GTP:	1	1	1	1	1	1

DISTRIBUTION POINT: Richmond, VA

				DESTINATION DEPOT			
	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
DIRECT DELIVERY COST ESTIMATE							
Wgt	3,497,104	3,648,549	471,636	4,819,613	3,071,575·	1,693,382	17,201,859
Count	4,142	6,125	2,042	5,872	7,051	4,635	29,867
Cost	$407,722	$1,221,323	$92,052	$765,421	$238,160	$507,117	$3,231,795
CONSOLIDATION COSTS							
INBOUND COST ESTIMATE							
Wgt	3,497,104	3,648,549	471,636	4,819,613	3,071,575	1,693,382	17,201,859
Count	4,142	6,125	2,042	5,872	7,051	4,635	29,867
Cost	$255,211	$288,032	$61,613	$354,259	$238,130	$153,422	$1,350,667
CONSOLIDATION COST ESTIMATE							
Factor per CWT 1.35	$47,211	$49,255	$6,367	$65,065	$41,466	$22,861	$232,225
OUTBOUND COST ESTIMATE							
Rate Factor	1.50	0.95	1.22	0.89	200.00	0.95	
#Truckloads	116.57	121.62	47.16	160.65	102.39	56.45	
TL Weight	30,000	30,000	10,000	30,000	30,000	30,000	
Miles	232	2820	442	804	1	2097	
Total Cost	$40,566	$325,815	$25,432	$114,957	$20,477	$112,449	$639,698
TOTAL CONSOLIDATION COST ESTIMATE							
	$342,988	$663,103	$93,413	$534,281	$300,073	$288,732	$2,222,590

COST ANALYSIS

COST DIFFERENCE
Consolidation - Direct   ($1,009,205)
BREAKEVEN POINT
Consolidation Factor   7.22

FACTORS								
CONSOLIDATION POINT	WEIGHT:	1	1	1	1	1	1	
WEIGHT	1 RATE:	1	1	1	1	1	1	
RATE	1 GTP:	1	1	1	1	1	1	

DISTRIBUTION POINT: Harrisburg, PA

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
				DESTINATION DEPOT			

DIRECT DELIVERY COST ESTIMATE

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
Wgt	5,471,255	5,345,769	1,703,239	5,942,964	3,926,059 ·	3,463,493	25,852,799
Count	5,510	6,165	4,591	7,878	6,473	7,042	37,659
Cost	$526,364	$1,797,264	$277,522	$1,131,739	$471,477	$1,014,322	$5,218,688

CONSOLIDATION COSTS

INBOUND COST ESTIMATE

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
Wgt	5,471,255	5,345,789	1,703,239	5,942,964	3,926,059	3,463,493	25,852,799
Count	5,510	6,165	4,591	7,878	6,473	7,042	37,659
Cost	$526,364	$540,501	$207,257	$616,120	$406,251	$378,262	$2,674,755

CONSOLIDATION COST ESTIMATE

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
Factor per CWT							
1.35	$73,862	$72,168	$22,994	$80,230	$53,002	$46,757	$349,013

OUTBOUND COST ESTIMATE

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
Rate Factor	200.00	0.96	1.37	0.88	2.25	0.96	
#Truckloads	182.38	178.19	56.77	198.10	130.87	115.45	
TL Weight	30,000	30,000	30,000	30,000	30,000	30,000	
Miles	1	2722	359	921	232	1994	
Total Cost	$36,475	$465,640	$27,923	$160,555	$68,313	$220,999	$979,905

TOTAL CONSOLIDATION COST ESTIMATE

	Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
	$636,701	$1,078,309	$258,174	$856,905	$527,566	$646,018	$4,003,673

COST ANALYSIS

COST DIFFERENCE
Consolidation - Direct ($1,215,015)
BREAKEVEN POINT
Consolidation Factor 6.05

FACTORS

		Mechanicsburg	Tracy	Columbus	Memphis	Richmond	Ogden
CONSOLIDATION POINT WEIGHT:		1	1	1	1	1	1
WEIGHT	1 RATE:	1	1	1	1	1	1
RATE	1 GTP:	1	1	1	1	1	1

DISTRIBUTION POINT: Secaucus, NJ

		Mechanicsburg	Tracy	Columbus	DESTINATION DEPOT Memphis	Richmond	Ogden	TOTAL ALL DEPOTS
DIRECT DELIVERY COST ESTIMATE								
	Wgt	16,753,647	14,723,718	4,217,953	19,028,668	9,297,912.	7,216,581	71,238,479
	Count	29,574	25,915	28,189	35,138	38,341	51,179	208,336
	Cost	$1,814,107	$5,057,244	$741,471	$3,916,190	$1,217,689	$2,360,075	$15,106,776
CONSOLIDATION COSTS								
INBOUND COST ESTIMATE								
	Wgt	16,753,647	14,723,718	4,217,953	19,028,668	9,297,912	7,216,581	71,238,479
	Count	29,574	25,915	28,189	35,138	38,341	51,179	208,336
	Cost	$1,438,040	$1,283,428	$456,861	$1,666,367	$852,680	$761,492	$6,458,868
CONSOLIDATION COST ESTIMATE								
Factor per CWT 1.35		$226,174	$198,770	$56,942	$256,887	$125,522	$97,424	$961,719
OUTBOUND COST ESTIMATE								
	Rate Factor	1.30	0.93	0.92	0.89	1.04	0.97	
	#Truckloads	558.45	490.79	140.60	634.29	309.93	240.55	
	TL Weight	30,000	30,000	30,000	30,000	30,000	30,000	
	Miles	185	2881	522	1066	316	2153	
	Total Cost	$134,308	$1,314,990	$67,521	$601,775	$101,856	$502,373	$2,722,823
TOTAL CONSOLIDATION COST ESTIMATE								
		$1,798,523	$2,797,188	$581,324	$2,525,029	$1,080,057	$1,361,289	$10,143,410

COST ANALYSIS

COST DIFFERENCE
Consolidation - Direct   ($4,963,366)
BREAKEVEN POINT
Consolidation Factor   8.32

FACTORS							
CONSOLIDATION POINT WEIGHT:	1	1	1	1	1	1	
WEIGHT	1 RATE:	1	1	1	1	1	1
RATE	1 GTP:	1	1	1	1	1	1

EMD
9-87
DTIC